REVIEWS

Temperature—Its Measurement and Control in Science and Industry. (Reinhold Publishing Co., New York), 1941. Pp. xiii + 1362. Price $11.00.

The first statement of the Foreword that "This book is the record of a 'Symposium on Temperature—Its measurements and control in Science and Industry' held .... under the auspices of the American Institute of Physics" .... perhaps represents the best review of the work. As a matter of fact it can hardly be described as a "book", for neither has it been written in that form nor does the subject-matter covered lends itself to be treated in a book form of the conventional type. It is simply a collection of papers embodying the results of numerous investigations presented at the symposium, and as such forms an excellent reference volume on the subject of temperature control and measurements in diverse fields including theoretical and experimental physics, applied and industrial chemistry, engineering and metallurgy, natural sciences, biology and physiology, etc., etc.

The measurement and control of temperature is one of the subjects which pervades almost all industrial operations and on it depends the success or failure of an industry and the quality of the product. In spite of the great importance of the subject, and the advances made in it in the past few years, it has not received as much attention as it deserves as a separate subject. The American Institute of Physics is to be congratulated for having conceived the idea of such a symposium for having carried it through to its logical conclusion.

Some 125 papers representing the work of at least a similar number of authors contained in the volume have been grouped under thirteen different headings, which it may not be out of place to repeat here:

(1) Temperature and Temperature Scales. (2) Precision Thermometry. (3) Education. (4) Natural Sciences. (5) Temperature in Biology. (6) Temperature and Its Regulation in Man. (7) Automatic Temperature Regulation and Recording. (8) Special Application and Methods. (9) General Engineering. (10) Metals and Ceramic Industries. (11) Oil Industries. (12) Optical and Radiation Pyrometry. (13) Thermometric Metals and Alloys.

The papers and their discussions are followed by an Appendix containing 25 tables of useful data, a glossary giving definitions of technical terms and two very comprehensive indexes. The book is well printed, but the bulk of it suggests that it might have been conveniently split up in two separately bound volumes.

It is not possible in the course of a short review to do full justice to this comprehensive collection of papers containing the most up-to-date information on the subject. Suffice it to say that no individual or institution interested in any branch of science, pure or applied, covered by or related to those listed under the thirteen items above, can afford to miss this publication.

LAL C. VERMAN.

Air and Its Mysteries. By C. M. Botley, with a Foreword by Sir Richard Gregory. (The Book Club, London), 1940. Pp. 266. Price 2*sh.* 6*d.*

The book is not a text-book. It is intended to be of use to the lay reader in this air-minded age to enable him to appreciate some of the marvels of the atmosphere. The reader starts on his tour into the realms of the atmosphere in the first chapter on "The Ocean of Air". In the next 8 chapters he makes acquaintance with matters meteorological such as the composition of the atmosphere, the wind circulation, the clouds, the different manifestations of water vapour and its forms of precipitation, thunderstorms, the optical phenomena in the atmosphere and the science of weather and climate. A chapter on "The Realm of Sound" gives him later an idea of the properties of the atmosphere in relation to sound waves, including the interesting phenomena of the zones of silence. Then follows a chapter on "The Highways of the Air" in which the reader learns of the mechanism of the flight of birds, insects and the gliding mammals, as well as man's failures and successes with balloons, airships and aeroplanes. The last chapter "Towards the Unknown Region" opens a fascinating vista. It gives one a glimpse of the progress of knowledge about the regions in space

around the earth from the days of Wilson and Melville of Glasgow when they first raised thermometers with kites in 1749, down through the period of Glaisher, Tissandier and other pioneers, right to Piccard and Millikan. The chapter also gives the reader some idea of radio-sondes, cosmic rays, ozonosphere and the ionosphere, as well as of the enthralling manifestations of the auroras.

The style is easy, straightforward and particularly pleasant, because of the historical background, literary allusions and artistic touches that one finds interspersed in a large collection of scientific facts. The format is good; there are hardly any printing mistakes. The only two blemishes that the reviewer noticed were a mis-print of "weigth" for "weight" on page 5, and the total absence of the frontispiece of an Antarctic scene of optical phenomena referred to on page 87. The book contains 16 beautiful plates from photographs and over 20 text-figures. But the Index is not as full as one would wish.

On reading the book, one is reminded of D. Brunt's "Weather Science for Everybody" (1936) which presents meteorology, also to the lay reader, in a more formal manner. Besides the general reader, Miss Botley's book could be useful also to High School students whose curriculum may include physical geography, covering elementary meteorology. For these students, if Brunt's book were to serve as a text-book, Botley's book could form an excellent supplement for "rapid reading". V. V. SOHONI.

Practical Solution of Torsional Vibration Problems. By W. Ker Wilson. Second Edition, Volume I. (Chapman & Hall, Ltd., London), 1940. Pp. xx + 731. Price 42*sh.*

There is no doubt that at the present time Engineers are realising more and more that the study of vibration is an accompaniment of sound design. This is especially true of Torsional Vibration as it does not exhibit any external symptoms of approaching destruction, as can be usually noticed with other forms of vibration.

Since the author published the first edition of this book in 1935, considerable progress has been made in the study of torsional vibration, and this has necessitated his rewriting a major portion of the original text and adding several new chapters.

In this, the first of the two volumes of the second edition, a large amount of new practical design data has been added and high speed engine systems have been treated more comprehensively. The earlier chapters deal with the fundamentals of torsional vibration, with the calculations of natural frequency and with equivalent oscillating systems in a very thorough manner. The study of flexible couplings occupies one very large chapter, special attention being drawn to the use of rubber as a structural material in rubber-in-shear couplings under the heading "Geared Systems" considerable addition has been made and the treatment of geared engines supported on flexible mountings and of high frequency tuning as a method of solving vibration problems, are of special importance. Of particular interest also is the study of Aero engine and Air screw installations and of vibration absorbers, specially the rotating pendulum absorber which is considered to be "one of the most valuable contributions to aircraft engine design in many years". The introduction of this pendulum absorber has considerably reduced the wear on the engine parts and the operating mechanism of the variable pitch air screws.

The attempts made in recent years to assess torsional vibration stresses in resonance and to draw up reliable empirical formulæ based on test results have prompted the author to include in this volume a description of the accurate instruments which have been developed for measuring torsional vibration frequencies and amplitudes of all types of engines and installations, including the latest types of electrical measuring instruments also. The theory of these instruments is discussed in full and the methods of calibration also given.

The text is profusely illustrated with worked numerical examples and this enhances the value of the book as an aid to the designing engineer. E. K. R.

The Social Life of Animals. By W. C. Allee. (The Scientific Book Club, London), 1941. Pp. xiv + 261. Price 2*sh.* 6*d.*

This interesting book ably maintains the excellent standard set up by its predecessors, which the Club has been issuing since its inception. The book contains quite a large mass of material which will entertain and stimulate the professional biologist and the lay reader alike. Professor Allee is

well known for his investigations on the group behaviour of animals, and this is a branch of study whose fascination and general implication have recently recruited a large number of scientists trained in the analytical and statistical methods of work.

We have some exceedingly able treatises dealing with the mysteries of animal behaviour and Professor Allee's book will rank high in the series. Though the actions of animals sometimes seem easy to comprehend, the lower we go down in the scale of life, the mystery becomes almost bewildering. Have the animals the faculty of reason? How do they act with purposiveness? The answer has been "by instinct". Does the theory of *instinct* apply to man? It would appear that all animals including man behave in the generality of cases like automata, equipped with a nervous mechanism enabling them to act in a particular way in a given situation. This is the mechanistic conception or explanation of the behaviour of animals, but it is possible to demonstrate by carefully planned experiments that behaviour patterns are subject to psychological laws governing animal nature, and the possibility of endowing animals with the faculty of adjusting their actions, due to the promptings of free will, amounts to an inescapable doctrine.

For over thirty years Professor Allee has been engaged in exploring the group behaviour of animals, which formed the subject of his Norman Wait Harris lectures at North-Western University, and this book has grown out of these lectures. "I make no effort to pose as the remote purveyor of a mysterious erudition; I could not in any case regard myself as more than the exponent of the glorified common sense which I more and more firmly believe all science should be." This is modesty but it does not preclude the author from presenting to the reader a fairly comprehensive fare, rendered palatable by his lucid and amusing style. Dealing with the particular line of group organisation usually known as "peck order" in chickens, the author writes, "putting the matter somewhat facetiously, chickens appear to have developed the sort of line organization characteristic of a military system or a fascist state, while pigeons, together with the ring doves, canaries and parakeets are more democratic". He accordingly derives the hypothesis that "social organization observed in birds and other animals reminds one almost constantly of certain types of human situations ..... it may well be that the social hierarchy of chickens, canaries and men must have much in common". The reader will find that the principal thesis of the book is to reveal a gradual development of social attributes, originating in the lower animals in simple forms and culminating in coupled tendencies in the higher mammals, thus having a common substratum for all types of behaviour patterns. This extraordinarily interesting phenomenon is dealt with in six chapters commencing from the third.

This book, at once scholarly and humorous, will form an important contribution to biology, the cultural value of which can hardly be exaggerated. It is illustrated by numerous figures, diagrams and graphs, and is provided with an extensive bibliography which enhances its usefulness to students who wish to acquire more information than is provided by the book. Great care has been taken with the arrangement of the material and the effect is that the reader is offered a constructive argument and a comprehensive picture.

Sons of the Soil, *Studies of the Indian Cultivator.* Edited by W. Burns, Agricultural Commissioner with the Govt. of India. (Manager of Publications, Civil Lines, Delhi), 1941. Pp. 128 + 44 plates. Price Rs. 2–6–0 or 4*sh.*

A series of pen pictures of the different types of the Indian cultivator drawn by several authors have been brought together under the editorship of Dr. W. Burns, Agricultural Commissioner with the Government of India, and published under the above title. The types brought together are very varied and represent cultivators from many different parts of India; there is as much diversity as can be seen in the picturesque crowds of *mela* and the descriptions form both entertaining and instructive reading. Few people see the cultivator in his village and fewer still know anything of him other than as a type, half-clad, poverty-stricken, quarrelsome, insatiably fond of litigation and the law court, ignorant, immeasurably in debt, conservative to a degree, thriftless, improvident and so on. To these the book will come as an agreeable surprise, for the type is here resolved into the individual clothed in flesh and blood and seen in his

home, on his field, in the midst of his family, his oxen and his sheep, his temple, his priests, his feasts and fasts and festivals as a man with virtues to praise and weaknesses to pity, the man as apart from the "guinea stamp" and who is "the gow'd for a' that". The group is very comprehensive; there are Afridis, Pathans and Baluchis, adepts with the gun as with the plough; there are other warrior cultivators, Panjabis, Jats, Scindhis, Moslems from the U.P.; there are the men from Assam, Bengal, Bihar, Orissa; cotton cultivators from the typical cotton tracts of the Berars and Maharashtra; Madrasis and Burmans; there are men wedded to the land and there are aboriginal tribes with their shifting cultivation; there are the prosperous looking men in very consequential attire and there are men exhibiting their manly frames as God made them; bright open faces of the boy cultivators alongside the furrowed crows'-footed faces of these old "horny-handed sons of toil", showing what this ancient craft can do to the "human face divine". What kind of house does he live in, what does he eat, how much or how often, what are his clothes, his furniture, his utensils, what is his daily routine, what are his amusements, his pleasures, his domestic cares, the codes of his caste or his religion, the customs at marriages, feasts or funerals—to these and similar questions the reader will find an interesting variety of answers. Not the least entertaining part of the answers is the lore of proverbs, which so pithily sum up the hoary wisdom of the cultivator, so helpful, so amusing and so illuminating. The womenfolk come in for a goodly share of the descriptions; they are worthy helpmates as much in the field as in the home, who are often shrewder and better able to drive a bargain than the brawny male. The book is illustrated with a fine set of photographs of the different types which lend very great charm to the book. As an entertaining little book on the ways of the Indian ryot and, we may add, of his wife, the volume is a little gem.

A. K. Y.

CENTENARIES

Paracelsus (1490-1541)

PARACELSUS, a German physician, was born in Einsiedaln about 1490. His surname was Hohenheim; but he gave it up for the one of his own making. At a comparatively early age he questioned what was taught to him in Medicine by his father and struck out new ways himself. He did similarly when he entered the university of Basel. He left school chemistry and started for the mines in Tirol and preferred to learn by going to nature herself. He then went wandering over a great part of Europe. The book of nature, he affirmed, is that which the physician must read. Though others called him an ignorant vagabond, he himself valued his knowledge differently and wrote "Whence have I all my secrets, out of what writers and authors? Ask rather how the beasts have learned their arts. If nature can instruct irrational animals, can it not much more men?" He had thus acquired great stores of facts which gave him an unquestionable superiority to his contemporaries. So in 1526, on his return to Basel, he was appointed town physician and a lecturer in the University.

He broke away from tradition. His lectures were in German and not in Latin. They were expositions of his own experience and of his own methods of curing and were not commentaries on the text of Galen. For a couple of years this new venture brought him reputation and practice. But in due course jealousy and enmity gathered sufficient momentum to drive him away and he ended his life in a miserable way.

For centuries he was evaluated in every possible way. But now it is acknowledged that his vigorous attacks on the degenerate Galenism of his day helped the foundation of modern scientific medicine. His *Chirurgia magna* went through ninteen editions and translations into several languages. He is credited with the discovery of the inherited characters of syphilis. He protested against the excessive blood-letting in vogue at that time. It is claimed that he was one of the first to bid modern Europe think for a moment upon the idea that diseases are inflicted neither by saints nor demons. Thus and in several other ways Paracelsus helped the downfall of the scholastic medical science of his time.

Paracelsus died at Selzburg 24 September 1541.

De Candolle, Augustin Pyramus (1778-1841)

AUGUSTIN PYRAMUS DE CANDOLLE, a French botanist, was born at Geneva 4 February 1778. Having had his education at the college of Geneva, he went to Paris in 1796 and became a favourite pupil of the botanist, Desfortaines. In 1808 he became pro-